

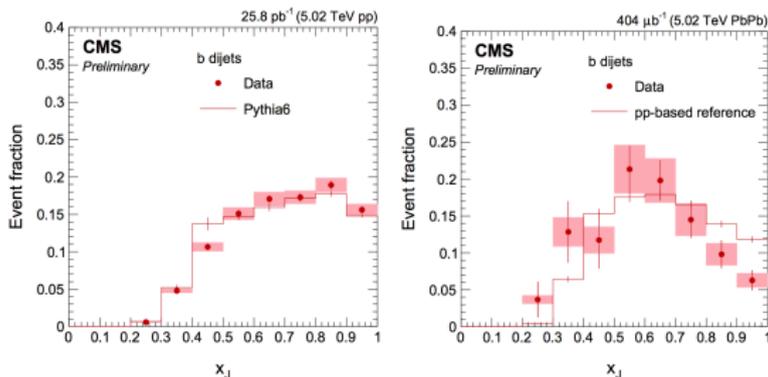
Study of Di b-jet momentum imbalance for sPHENIX

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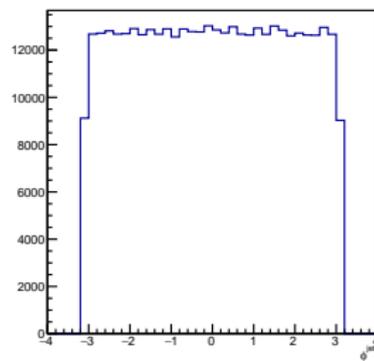
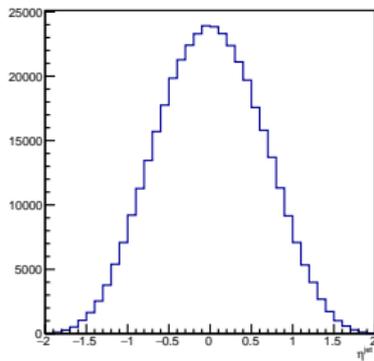
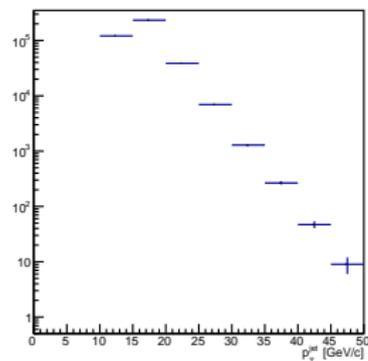
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Overview



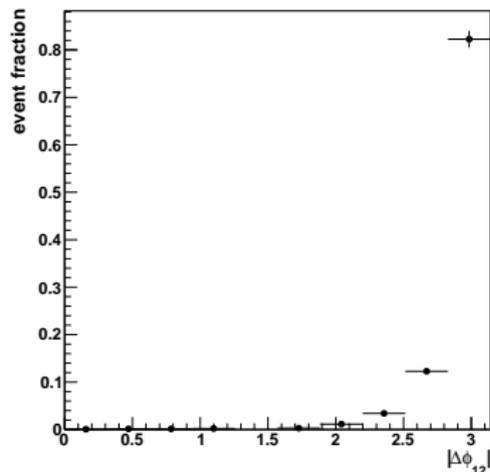
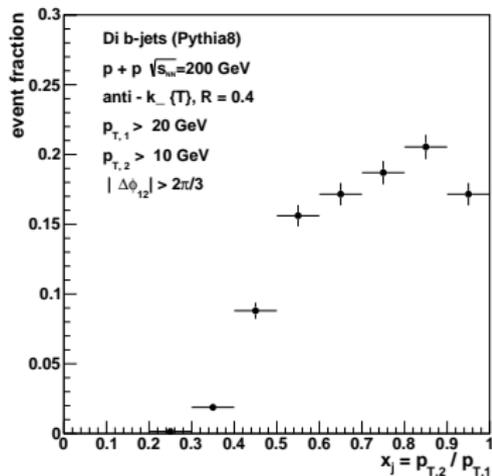
- CMS has measured the jet momentum imbalance in $p + p$ (Left) and Pb+Pb (Right) – [CMS-HIN-16-005](#)
- Look at sPHENIX performance expectations for a similar measurement.
- Setup:
 - ▶ Use PHPythia8
 - ▶ Now using <https://github.com/sPHENIX-Collaboration/analysis/blob/master/HF-Jet/TruthGeneration/macros/phpythia8.cfg> (CTEQ6L, HardQCD::all)
 - ▶ Look at truth level jets (i.e. no GEANT simulation)
 - ▶ Assume a b -jet tagging efficiency of 0.5 and a purity of 1
 - ▶ For Au+Au, assume a b -jet $R_{AA} = 0.6$
- Code: [sPHENIX-Collaboration/analysis/blob/master/HF-Jet/HFDiJetMomImbalance/macros/Draw_BDiJetImbalance.C](#)

b-jet kinematics



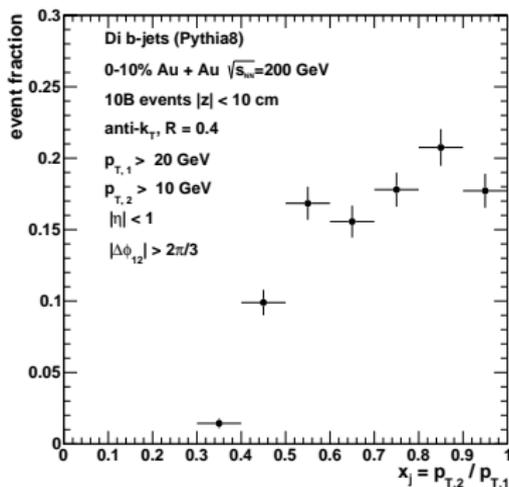
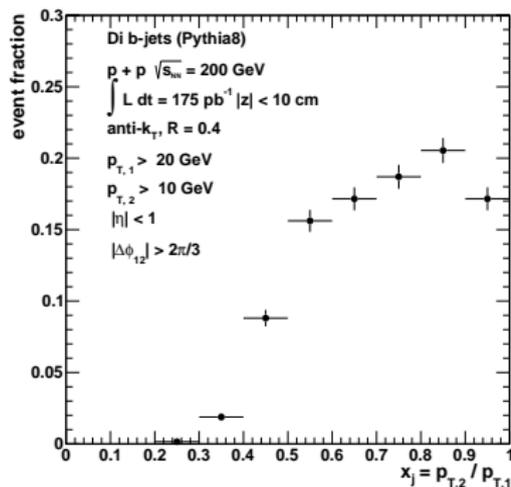
- Trigger on b -jet with $p_T > 10$ GeV and $|y| < 2$
- Use $R = 0.4$ truth jets

b-jet imbalance and $\Delta\phi$



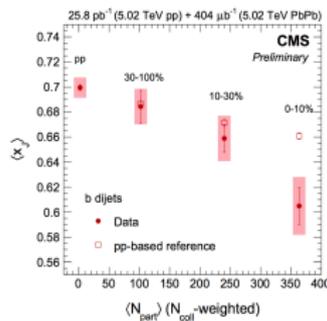
- Look for 2 b-jets in the same event
- Require $|\Delta\phi| > 2\pi/3$
- Require $|\eta_j| < 1$ for both jets

sPHENIX Di- b -jet momentum imbalance



- For $p + p$ use integrated luminosity of $\int \mathcal{L}_{pp} dt = 175 \text{ pb}^{-1}$
- For 0-10% Au+Au use $n + n$ equivalent luminosity of $\int \mathcal{L}_{nn} dt = N_{ev}^{AuAu} * \langle N_{Coll} \rangle / \sigma_{nn} = 10B \times 962 / 42\text{mb} = 229 \text{ pb}^{-1}$

Momentum imbalance vs. N_{coll}



	N_{evt}	N_{coll}	$\int \mathcal{L}_{nn} dt [pb^{-1}]$	$\langle x_j \rangle$
$p + p$	—	—	175	0.722 ± 0.003
Au+Au 0-10%	10B	962	229	0.722 ± 0.005
Au+Au 10-20%	10B	603	144	
Au+Au 20-40%	20B	296	141	
Au+Au 40-60%	20B	94	45	
Au+Au 60-92%	32B	15	11	

- (Left) Plot from CMS
- I'll try and come up with a similar plot for sPHENIX vs N_{coll} today/tomorrow

Thank You!

PHPythia config

```
! Beam settings
Beams:idA = 2212    ! first beam, p = 2212, pbar = -2212
Beams:idB = 2212    ! second beam, p = 2212, pbar = -2212
Beams:eCM = 200.    ! CM energy of collision

! Settings related to output in init(), next() and stat()
Init:showChangedSettings = on
#Next:numberCount = 0          ! print message every n events
Next:numberShowInfo = 1       ! print event information n times
#Next:numberShowProcess = 1    ! print process record n times
#Next:numberShowEvent = 1     ! print event record n times

! PDF
# PDF:useLHAPDF = on
# PDF:LHAPDFset = CT10.LHgrid
PDF:pSet = 7 ! CTEQ6L, NLO alpha_s(M_Z) = 0.1180.

! Process
#HardQCD:hardccbar = on
# HardQCD:hardbbbbar = on
HardQCD:all = on
# Charmonium:all = on
# Bottomonium:all = on
# SoftQCD:nonDiffractive = on

! Cuts
PhaseSpace:pTHatMin = 10.0
```